Scientific summary (Scientific report)

a. What were the main scientific objectives of the grant?

There is a high geographical variation in total knee replacement (TKR) in Australia, but with limited research on the drivers of the variation. The main scientific objectives of the grant are to explore the magnitude of the variation between local government areas (LGA) in Australia and analyse relevant explanatory variables.

b. What were the main scientific achievements of the grant?

We utilised the population-based data on TKR during 2015-2019 from the Australian Orthopaedic Association National Joint Replacement Registry (AOANJRR) and demonstrated the variation was partially explained by differences in age, arthritis prevalence and density of orthopaedic surgeons in the local areas. Our study suggested that demographic patterns and arthritis prevalence at the LGA level have great implications for predicting and planning OA service needs than other factors.

The study also demonstrates a new approach to incorporating local needs and supply factors and estimating their contribution to the geographic variations in TKR. The resultant local estimates of TKR rate ratios for the whole of Australia can be used by all local-based healthcare units when planning health services to reduce unmet demand.

This is not only relevant to surgical services but also relevant to the whole OA care pathway. Australian priority actions that may benefit from our findings include decision-making aids to identify people who would benefit from TKR surgery compared to other treatments, equitable health service provision for everyone with OA, being able to target communities at urgent needs of OA care and thus lowering the financial burden of OA to the healthcare system. The research promotes an efficient clinical pathway from diagnosis of severe OA to the execution of surgery in people that are suitable for TKR, and beyond.

c. What problems, if any, did you encounter in achieving the project's objectives, and how did you address them?

During the course of conducting the project, we found many variables related to health demands and supplies were not available or could not be accurately measured. For example, certain individual-level data, such as patient preference or provider characteristics are generally not available, hence limiting our ability to analyse the effects of these variables. We, therefore, utilised multilevel regression modelling by collapsing individual-level patient data into ten cross-tabulation counts within each LGA. This modelling technique allows us to investigate variations between age-sex groups (level-1 units) and LGAs (level-2 units) simultaneously.

Additionally, we do not have the precise measures for distance to hospitals or orthopaedic surgeons in the data, due to confidentiality of patient data. We, therefore, used density of surgeons within patients' local residential areas. However, the density of surgeons may not accurately depict the supply of, or access to orthopaedic care, as many Australians can freely choose where and with whom to undertake their surgery and may seek care from surgeons outside their area of residence. People living outside capital cities may need to travel large distances to undertake surgery.

d. Have you disseminated, or plan to disseminate, the results of this research?

We have submitted a manuscript entitled "Geographical variation of primary knee joint replacement for osteoarthritis in Australia" to be considered for publication as an "original research" article in the MJA. We also plan to disseminate the research to the next OARSI World Congress.